

Amendment

Reply to Office Action dated February 19, 2009

AMENDMENTS TO THE CLAIMS

This listing will replace all prior versions, and listings, of claims in the application:

1. (Currently amended) An engine unit, particularly for urban transport, comprising:
an engine supplied with a compressed gas and having an expansion chamber provided with
a cylinder and piston arranged for completing cyclically a power and an exhaust stroke at each
double stroke;
a liquid gas tank in communication with the engine; and
a liquid fuel tank;
means for gasifying the liquid gas, which are interposed between the liquid gas tank and
the engine for obtaining compressed gas, the gasifying means comprising a gasification chamber
heat exchanger for a starting gasification of the liquid gas in communication with the liquid gas
tank; and a liquid fuel tank which is connected to the gasification chamber,
a close housing wherein the a gasification chamber is formed, the gasification chamber
being in fluid communication with both the liquid fuel tank and the heat exchanger for the
combustion of the liquid fuel with the oxygen of the liquid compressed gas, the gasification
chamber being further in fluid communication with and the expansion chamber through a port so
that [[a]] the entire gas mixture comprising compressed liquid gas, and gaseous products and
by-products of combustion process passes into the expansion chamber are used to do useful work;
an intake manifold and an intake duct placed between the port of the gasification chamber
and the expansion chamber, wherein the intake duct puts the expansion chamber in
communication with the intake manifold through a respective intake valve; and
controlling means provided for opening said intake valve for a first duration in such a way
that the piston of the engine is pushed by a constant pressure of the gas from the gasification
chamber, and for closing said intake valve for a second duration in such a way the piston of the
engine is pushed by gas expansion,
wherinc the gasification chamber is split into a first gasification chamber and a second
gasification chamber for combustion of the liquid fuel with the oxygen under conditions of

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saturated steam and overheated steam respectively, each of said first and second gasification chambers comprising a respective pilot igniter.

2. (Currently amended) An engine unit according to Claim 1, wherein said expansion chamber is provided with an intake valve and wherein [[a]] the first duration for opening the intake valve is selected so that the gas mixture, at the end of the piston power stroke, has substantially attained ambient pressure and temperature.

3. (Currently amended) An engine unit according to Claim 1, wherein said expansion chamber is provided with an exhaust valve and wherein controlling means are provided for opening said exhaust valve in such a way that the cylinder is emptied of the spent gas, which is discharged in the ambient atmosphere, and for closing said exhaust valve so as a pressure increase occurs within the cylinder until a pressure value is reached, being equal to that of the gasification chamber that a duration for opening the exhaust valve is selected so that, at the end of the piston exhaust stroke, when the intake vale has to open, substantially the same pressure as in the gasification chamber prevails in the expansion chamber.

4. (Cancelled)

5. (Previously presented) An engine unit according to Claim 1, wherein the liquid gas is of liquid air or of air depleted of oxygen.

6. (Previously presented) An engine unit according to Claim 1, wherein the liquid gas is liquid nitrogen.

7. (Previously presented) An engine unit according to Claim 6, wherein the gasifying means comprise an oxygen tank in communication with the gasification chamber for combustion of the liquid fuel.

8. (Previously presented) An engine unit according to Claim 1, wherein the liquid fuel is liquid hydrogen.

9. (Cancelled)

10. (Previously presented) An engine unit according to Claim 1, wherein the gasifying means comprise a pump between the liquid gas tank and the gasification chamber.

11. (Previously presented) An engine unit according to Claim 1, further comprising a pump between the liquid fuel tank and the gasification chamber.

12. (Previously presented) An engine unit according to Claim 7, further comprising a pump between the oxygen tank and the gasification chamber.

13. (Previously presented) An engine unit according to Claim 10, wherein the pump is a variable delivery pump used for controlling the engine speed.

14. (Previously presented) An engine unit according to Claim 1, further comprising a heat exchanger between the liquid fuel tank and the gasification chamber for a starting gasification of the liquid fuel.

15. (Cancelled)

16. (Currently amended) An engine unit according to Claim 1, wherein the ~~gasification chamber~~ is to a first gasification chamber which is in fluid communication with an oxygen tank and with the fuel tank, and wherein into a the second gasification chamber which is in fluid communication with the liquid gas tank, the first gasification chamber and the second gasification chamber being under thermal exchange condition for exchanging the combustion heat produced between the oxygen and the fuel.

17. (Previously presented) An engine unit according to Claim 16, wherein the first gasification chamber and the second gasification chamber are in fluid communication through a thermal exchange chamber.

18. (Previously presented) An engine unit according to Claim 16, wherein the second gasification chamber is directly inserted inside the first gasification chamber.

19-20. (Cancelled)

21. (Currently amended) A method for supplying with a compressed gas an engine particularly for urban traction and having an expansion chamber provided with a cylinder and a piston arranged for completing cyclically a power and an exhaust at each double stroke, the method[.]] comprising the following steps of gasifying a liquid gas thus obtaining compressed gas; wherein

extracting heat from the ambient atmosphere with a heat exchanger to achieve a starting gasification of the liquid gas;

combusting, in a close housing in which a gasification chamber is formed, the gasification is achieved by combustion of a predetermined limited amount of a liquid fuel and oxygen contained in the liquid gas, so that to achieve a further gasification, wherein combustion is performed in the same close area where the further gasification of the liquid gas takes place, the combustion heat being conveyed into the gasification area, the combustion taking place in the presence of a pilot igniter; and

supplying the engine is supplied with the entire gaseous mixture comprising the compressed gas and with gaseous products of combustion process,

wherein the compressed gas and gaseous products of combustion process pass through an intake manifold through a port of the gasification chamber and, from here, through an intake valve into the expansion chamber, and

wherein a working stroke of the piston is achieved by opening the intake valve for a first duration and pushing the piston at a constant pressure, and by closing the intake valve for a second duration and pushing the piston by gas expansion.

22. (Cancelled)

23. (Previously presented) A method according to Claim 21, wherein the liquid gas is of proper liquid air or liquid air depleted of oxygen, and wherein the combustion is performed with oxygen of the liquid air.

24. (Currently amended) A method according to Claim 21, wherein the liquid gas is of nitrogen and ~~that~~ wherein the combustion is performed with oxygen autonomously supplied with respect to the liquid gas.

25. (Cancelled)

26. (Previously presented) A method according to Claim 21, wherein the liquid fuel is liquid hydrogen.

27. (Cancelled)

28. (Currently amended) A method according to Claim 21, wherein the predetermined limited amount of the liquid fuel is selected to obtain compressed gas at a predetermined pressure comprised between 10 and 30 atmospheres ~~and preferably 20 atmospheres~~.

29-48. (Cancelled)

49. (New) A method according to Claim 21, wherein an exhaust stroke of the piston is achieved by opening an exhaust valve until the cylinder is emptied of the spent gas, which is
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discharged in the ambient atmosphere and by closing the exhaust valve until a pressure value is reached, being equal to that of the gasification chamber.

50. (New) A method according to Claim 28, wherein the predetermined pressure of the compressed gas is 20 atmospheres.